

**REMARKS**

Favorable reconsideration and allowance of this application are requested.

**1. Response to Specification Objections**

By way of the amendment instructions above, the specification has been revised so as to insert new paragraphs based on each of originally filed claims 1-27. As such, direct unequivocal support exists in the specification text to thereby address the Examiner's criticisms advanced under 37 CFR §1.75(d)(1) and MPEP §608.01(o). No question of "new matter" under 35 USC §132 is of course presented by such specification amendments since each originally presented claim constitutes its own "disclosure".

**2. Discussion of Claim Amendments**

Claim 1 has been amended so as to include therein the substance of original claim 11. As such, claim 11 has been cancelled and the dependency of claim 12 changed accordingly. Several other clarifying amendments have also been proposed for certain other pending claims herein.

Claim 28 is new and requires *inter alia* that the molar ratio of the phase-transfer catalyst (PTC) to the first aldehyde is between 0.01 to 0.2 and that the PTC is separated from a process stream by water washing so as to recover the same, the recovered PTC thereafter being recycled for reuse in the crossed-alcohol condensation reaction. Support for new claim 28 may be found in the specification as originally filed, e.g., in FIGS. 2-3 and the textual description of the same in paragraphs [0015] and [0021] (especially lines 1-2 on page 12 of the latter paragraph).

Therefore, upon entry of the present amendment, claims 1-10 and 12-28 will remain pending herein. Favorable reconsideration and allowance of such claims are therefore solicited.

### **3. Response to 35 USC §102(b) Rejection**

Prior claims 1-11,15-22 and 24-27 attracted a rejection under 35 USC §102(b) as allegedly anticipated by Judge et al (UK 1 547 856).<sup>1</sup> Applicants respectfully disagree.

While it is true that Judge et al discloses a process using a PTC in a cross-aldol reaction, it is really at this point where the disclosure of Judge et al diverges from the present invention. Specifically, Judge et al fails to teach or suggest using a **water soluble** PTC in such a reaction. Applicants note that none of the catalysts listed in the Table at page 4 of Judge et al is considered as “water soluble” by a person skilled in the art.

In contrast to Judge et al, the claims pending in the subject application are directed an improved process for the preparation of alcohol using the crossed-aldol reaction in the presence of a **water soluble** PTC. In this regard, applicants note that there are at least two major improvements resulting from the use of a water-soluble phase-transfer catalyst as described in paragraph [0008] of the originally filed specification. First, the water soluble PTC improves the solubility of the hydroxide catalyst necessary for the crossed-aldol reaction in the longer chain aldehyde which in turn enhances selectivity for the desired crossed-aldol product versus the self-aldol product produced form the reaction of the shorter chain, more reactive aldehyde. Second, facile recovery of the water soluble PTC is possible from the organic product by aqueous washing.

Moreover, applicant notes that comparison of the data in the Examples of the

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<sup>1</sup> The Examiner's other rejection advanced under 35 USC §102(b) based on Barker et al (USP 4,426,542) has been mooted by the combination of claims 1 and 11.

subject application (which employs a water soluble PTC in accordance with the present invention) with Comparative Example 2 (which employs a PTC catalyst in accordance with Judge et al, namely tricaprylmethylammonium chloride). As demonstrated by such data, two yield improvements are evident – namely the total conversion of n-butyraldehyde to both 2,4-diethyl-2-octenal and 2-ethyl-2-hexenal and a higher yield increase (i.e., greater selectivity) for 2,4,-diethyl-2-octenal.

The yield increases demonstrated by the data in the Examples of the subject application are significant in commercial terms. Specifically, on a commercial scale, the US production capacity of 2-ethylhexanol is approximately 400,000 metric tons per year, with some individual production plants having production capacities of 130,000 metric tons per year. Since 2,4-diethyloctanol is a higher molecular weight alcohol than 2-ethylhexanol and the plasticizer formed from 2,4-diethyloctanol (i.e., bis(2,4-diethyloctyl)phthalate) has superior plasticizer properties as compared to the plasticizer formed from the lower molecular weight 2-ethylhexanol (i.e., di(2-ethylhexyl)phthalate), the former higher molecular weight alcohol commands significant price premium. Thus, on a large scale production plants, even seemingly modest yield improvements result in significant realized income for the producer. Thus, the yield improvements noted in the Examples of the subject application using a water soluble PTC in accordance with the present invention in comparison to Comparative Example 2 using the catalyst in accordance with Judge et al is quite significant technically.

Therefore, Judge et al does not teach or disclose all the elements of the claimed invention and as such cannot anticipate the same under 35 USC §102(b).

**4. Response to 35 USC §103(a) Rejection**

**A. Rejection of Claims 1-27 over Judge et al in view of Starks et al. and Halpern et al**

In order to establish a *prima facie* case of obviousness under 35 USC §103(a), it is axiomatic that the Examiner must establish all three of the following essential criteria: (1) the cited references must teach or suggest each of the claimed elements; (2) there must be a motivation in the cited prior art to combine the references as suggested by the Examiner; and (3) the cited references must provide a basis for a reasonable expectation for success. The motivation to combine and the reasonable expectation for success must come from the cited prior art and not the Applicant's specification. Further, it is not enough that a reference can be modified absent a suggestion in the cited prior art to undertake such modification.

As discussed above, Judge et al does not teach the use of a water-soluble phase-transfer catalyst. Starks et al also fail to teach recovering the phase-transfer catalyst from the water washing as correctly stated by the Examiner. Although Halpern et al mentions the use of Aliquat 100 (tetrabutyl ammonium bromide) and Aliquat 175 (methyl tributyl ammonium chloride) -- which are water soluble PTC catalysts – Halpern et al do not teach any specific use of these catalyst in a crossed-alcohol reaction as claimed in the present application. As noted previously, a significant improvement of the present invention is enhancing the selectivity of the crossed-alcohol condensation reaction through the use of a water-soluble phase transfer catalyst.

Thus, while water-soluble phase transfer catalysts may be known *per se* (e.g., as evidenced by Halpern et al) there is no motivation for a person skilled in the art to combine the use of such water soluble PTC catalyst in an alcohol reaction as described by Judge. Thus, one skilled in this art simply would not disregard the teaching of Judge et al with respect to use of the non- or only minimally water soluble PTC of Judge et al and

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substitute therefore a fully water soluble PTC as taught by the present applicants. Thus, withdrawal of the rejection advanced against claims 1-27 based on the combination of Judge et al, Starks et al and Halpern et al is in order.

**B. Rejection of Claims 1, 11 and 16-18 over Barker et al alone or in view of Halpern et al or Judge et al.**

Barker et al teach in Example 14 a process using tetrabutylammonium chloride as a phase transfer catalyst. However, Barker et al fail to teach or suggest a water washing step as correctly stated by the Examiner and a hydrogenation step. Since the use of a water soluble PTC catalyst in the present invention is not only for the ease of recycling of the catalyst but also for the enhanced selectivity of the crossed-alcohol condensation reaction, it is indeed unexpected for a skilled artisan to obtain such high selectivity the aldol condensation and crossed-alcohol condensation from the information provided by Halpern et al. Moreover, Judge et al is inappropriate for the reasons already discussed above.

Therefore, applicants respectfully submit claims 1, 11 and 16-18 cannot be rendered obvious by Barker et al alone or in combination with Halpern et al or Judge et al.

**5. Patentability of New Claim 28**

The comments above are equally germane to the patentability of new claim 28 over the applied references of record. In addition, applicants note that the molar ratio of the PTC to the first aldehyde in the base-catalyzed crossed-alcohol condensation reaction is contrary to the teaching of Judge et al. Specifically Judge et al at page 3, lines 44+ note that:

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"The exact amount of PTC is not critical because a finite amount of said catalyst produces a finite increase in the amount of product aldehyde...."

Contrary to Judge et al, therefore, the present applicants have found that when using a **water soluble** PTC, the amount of the same does have significant effects on the amount of the product aldehyde. Thus, this aspect also distinguishes claim 28 from Judge et al and the other applied references of record.

## **6. Conclusions**

Every effort has been made to advance prosecution of this application to allowance. Therefore, in view of the amendments and remarks above, applicant suggests that all claims are in condition for allowance and Official Notice of the same is solicited.

Should any small matters remain outstanding, the Examiner is encouraged to telephone the Applicants' undersigned attorney so that the same may be resolved without the need for an additional written action and reply.

An early and favorable reply on the merits is awaited.

Respectfully submitted,

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